

Claims

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3 1. A method, including the steps of
4 maintaining a set of access control patterns in at least one associative mem-
5 ory;
6 receiving a packet label responsive to a packet, said packet label being suf-
7 ficient to perform access control processing for said packet;
8 matching matchable information, said matchable information being respon-
9 sive to said packet label, with said set of access control patterns in parallel, and generat-
10 ing a set of matches in response thereto, each said match having priority information as-
11 sociated therewith;
12 selecting at least one of said matches in response to said priority informa-
13 tion, and generating an access result in response to said at least one selected match; and
14 making a routing decision in response to said access result.
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16 2. A method as in claim 1, including the step of performing at least two
17 of said steps of receiving, matching, selecting, and making a routing decision, in parallel
18 using a pipeline technique.
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20 3. A method as in claim 1, wherein said access control patterns each
21 include a bit pattern for matching and a mask pattern of bits not for matching.
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1 4. A method as in claim 1, wherein said access control patterns each
2 include a set of ternary elements, each representative of a logical "0," logical "1", or
3 "don't care" value.

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5 5. A method as in claim 1, wherein said associative memory includes a
6 hardware content-associative memory having a plurality of rows, each row including one
7 of said access control patterns and one of said access results.

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9 6. A method as in claim 1, wherein said associative memory includes a
10 hardware content-associative memory having a plurality of rows,
11 each row including a bit pattern for matching and one of said access results,
12 and
13 each row being associated with a pattern of bits not for matching, said set of
14 patterns of bits not for matching being fewer than a number of said rows.

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16 7. A method as in claim 1, wherein said associative memory includes a
17 ternary content-associative memory.

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19 8. A method as in claim 1, wherein said packet label includes a source
20 IP address or subnet, a destination IP address or subnet, a source port, a destination port, a
21 protocol specifier, or an input interface.

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1 9. A method as in claim 1, wherein said priority information for each
2 said access control pattern is responsive to a position of said access control pattern in a
3 memory.

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5 10. A method as in claim 1, wherein said priority information includes a
6 position in said associative memory, and said step of selecting includes choosing a first
7 one of said matches.

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9 11. A method as in claim 1, wherein said routing decision includes a
10 committed access rate decision.

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12 12. A method as in claim 1, wherein said routing decision includes an
13 administrative policy decision regarding treatment of said packet.

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15 13. A method as in claim 1, wherein said routing decision includes de-
16 termining an output interface for said packet.

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18 14. A method as in claim 1, wherein said routing decision includes im-
19 plementing a quality of service policy.

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21 15. A method as in claim 1, wherein said routing decision includes per-
22 mitting or denying access for said packet.

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2 16. A method as in claim 1, wherein said step of generating said access
3 result is responsive to a plurality of said at least one matches.
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5 17. A method as in claim 1, wherein said step of matching is performed
6 in order of constant time, whereby said step of matching is performed in time not respon-
7 sive to a number of said access control patterns.
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9 18. A method as in claim 1, wherein said steps of matching and selecting
10 are performed at a rate exceeding 1 megapacket per second.
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12 19. A method as in claim 1, including the step of making a preliminary
13 routing decision for said packet, wherein said packet routing information includes a result
14 of said preliminary routing decision.
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16 20. A method as in claim 19, wherein said preliminary routing decision
17 includes determining at least one output interface for said packet.
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19 21. A method as in claim 19, wherein said packet routing information
20 includes an output interface for said packet.
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22. A method as in claim 1, including the step of preprocessing said packet label to generate said matchable information.

23. A method as in claim 22, wherein said step of preprocessing includes the steps of performing an arithmetic, logical, or comparison operation on said packet label; and generating a bit string for said matchable information in response to said arithmetic, logical, or comparison operation.

24. A method as in claim 22, wherein said step of preprocessing includes the step of comparing a field of said packet label with an arithmetic range or mask value.

25. A method as in claim 22, wherein said step of preprocessing includes the step of comparing a source IP port value or a destination IP port value with a selected port value.

26. A method as in claim 1, including the step of postprocessing said selected match to generate said access result.

27. A method as in claim 26, wherein said step of postprocessing includes accessing a memory in response to a bitstring included in said selected match.

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28. A method as in claim 1, wherein said set of access control patterns is responsive to a sequence of access control specifiers, each one of said sequence of access control specifiers declaring whether to permit or deny access for a set of packets.

29. A method as in claim 28, wherein said step of maintaining includes the steps of receiving said sequence of access control specifiers; translating said sequence of access control specifiers into said sequence of access control patterns; and storing said sequence of access control patterns in said associative memory.

30. A method as in claim 29, wherein said step of translating includes the step of generating a plurality of said access control patterns in response to one of said access control specifiers.

31. A method as in claim 29, wherein said step of translating includes the step of generating a single one of said access control patterns in response to a plurality of said access control specifiers.